

Finding Microplastics In Campus

Students : Chia-En Tsai /SU, CHIH-HUNG

Teacher : Cheng-Chang Chen , Pei-Yi Bai

School : Hsin Tien Senior High school

Country : Taiwan Partnership



THE GLOBE PROGRAM TAIWAN
Global Learning and Observations to Benefit the Environment



新北市立新店高中

New Taipei Municipal Hsin Tien Senior High School

Introduction

Nowadays, the news reports catch the public's attention to microplastics issues.

We want to know the amount of microplastics in the water on campus, such as tap water, drinking water...., and discuss the result which we found.

Observation Steps



Equipment

Sample →

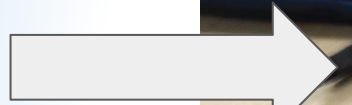
filter →

← Pull out air



Equipment

Small
microscope



Research Questions

- 1) How much microplastics are in drinking water
- 2) Does the temperature of the water affect the microplastic content in the water?
- 3) Whether cleaning the water outlet of the water dispenser can reduce the microplastic content of drinking water
- 4) Will the water outlet of the water dispenser on different floors have different microplastic content due to different air turbidity?
- 5) How much microplastics everyone consumes unknowingly from drinking water every day

Hypothesis

- 1) The content of microplastics in drinking water should not exceed 10/liter
- 2) The microplastic content of hot water may be less due to the high temperature
- 3) Cleaning the water outlet of the water dispenser can reduce the microplastics in drinking water
- 4) The air on the lower floor may be more turbid, so the content of microplastics attached to the water outlet of the water dispenser is also more.
- 5) Women may misuse 27 microplastics per day from drinking water, compared to 37 for men(11.5 cups (2.7 liters) a day for women;15.5 cups (3.7 liters) a day for men)

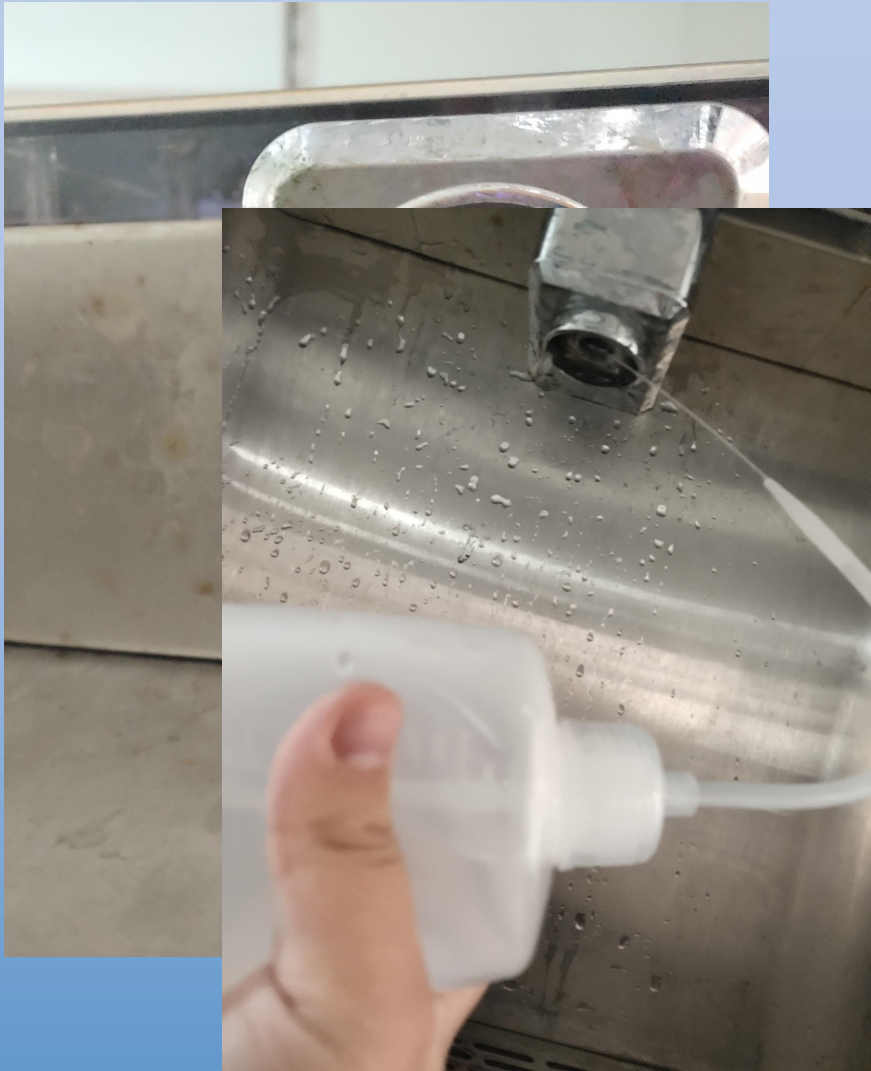
Method

- 1) Sampling 250 ml of hot water or cold water that has not been cleaned out of the water outlet.
- 2) Wash the dispenser and repeat the above actions.
- 3) Filter the sampled water with a filter bottle.
- 4) The filtered membrane is our final observation sample.
- 5) Observe the material on the filter membrane, find the microplastics and record.

Cleaning Water Dispensers



Water outlet



**The effect of microplastics
on temperature content—**



新北市立新店高級中學
海洋教育資源中心

鑫興龍國際有限公司



A1/A2
(2nd floor)

新北市立新店高級中學

歐德系統傢俱
連鎖事業(中央店)

西點麵包



中央路95巷

貝格爾新店托嬰中心

中央路105巷

中央路95巷

福方公司

Google

綜合運

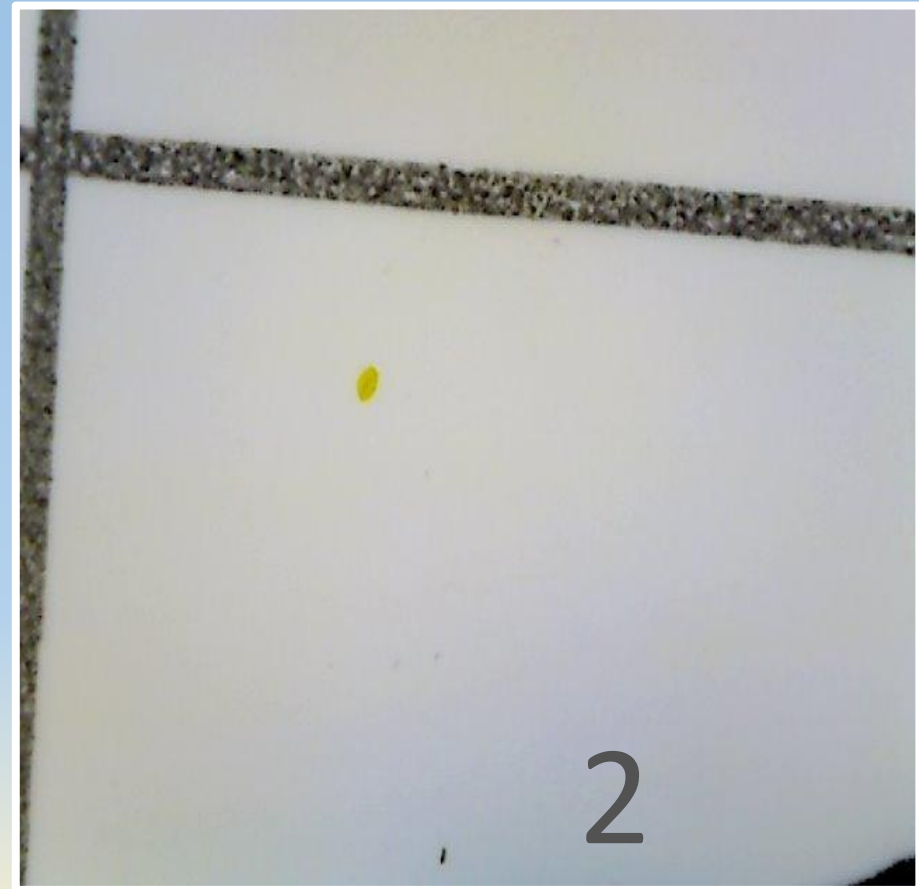
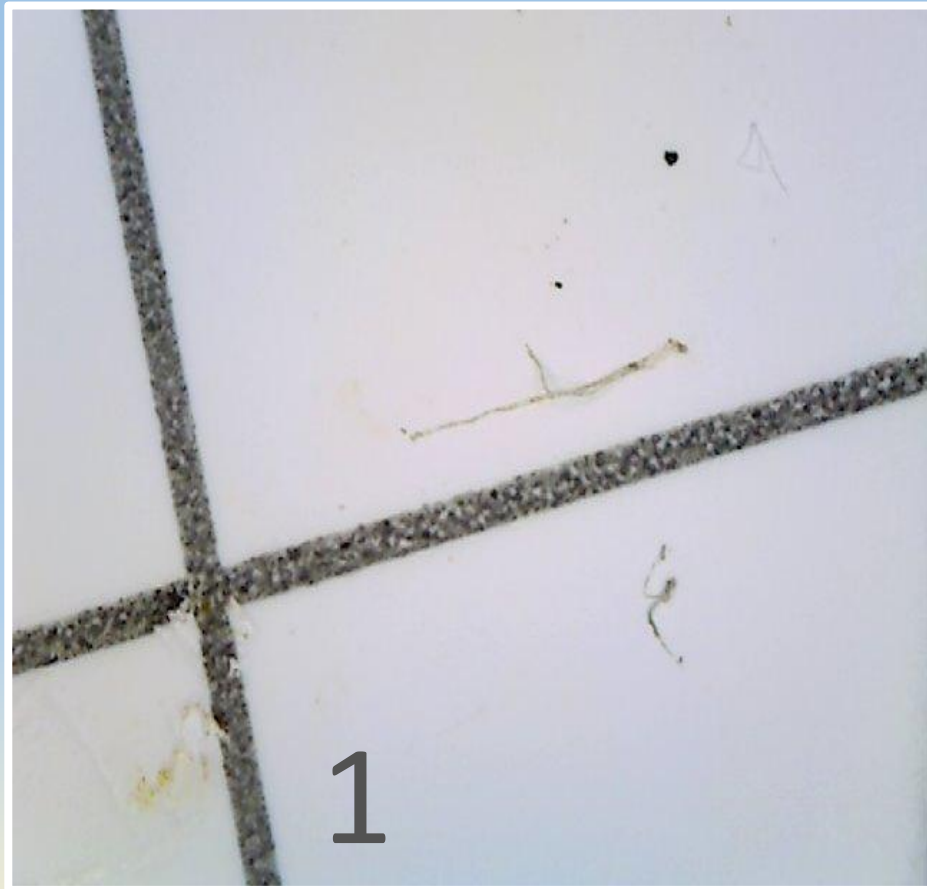
華城高

Variable : Temperature

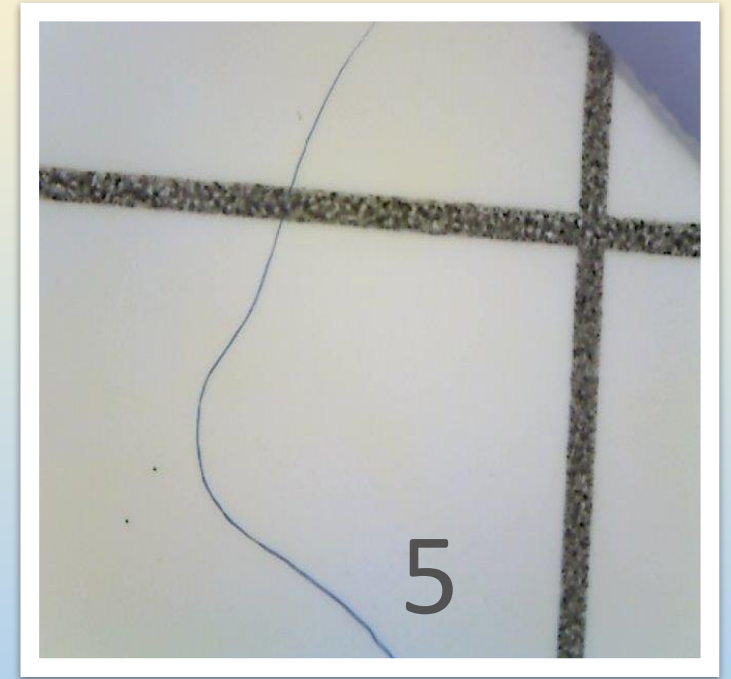
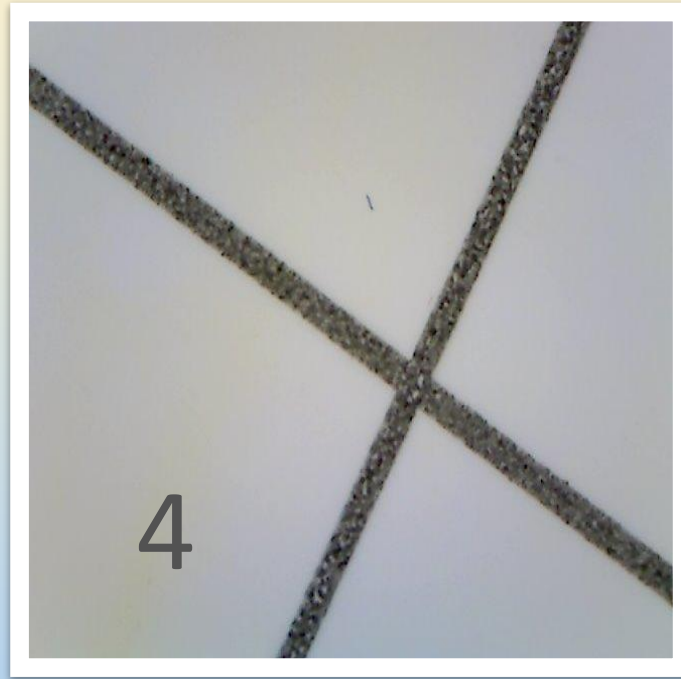
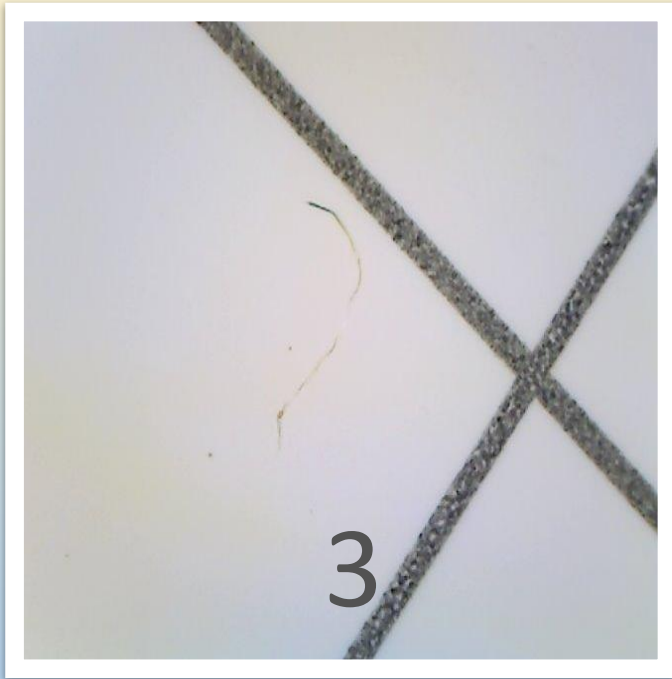
| Sample | A1 | A2 |
|-----------------|------------|------------|
| Temperature | 10°C | 100°C |
| Date | 2021/12/24 | 2021/12/24 |
| Washed | NO | NO |
| Filter Membrane | 1 | 1 |



A1



| CODE | GEOMETRY | COORDINATES | COLOUR | SURFACE APPEARANCE | PHOTO | OUR ASSESSMENT |
|------|----------|-------------|---------|--------------------|-------|----------------|
| 1 | FILAMENT | (7,-2) | UNCLEAR | ROUGH DIRTY | YES | branches |
| 2 | DOT | (1,7) | YELLOW | FLAT | YES | alga |



| CODE | GEOMETRY | COORDINATE S | COLOUR | SURFACE APPEARANCE | PHOTO | OUR ASSESSMENT |
|------|----------|--------------|--------------|--------------------|-------|----------------|
| 3 | FILAMENT | (2,3) | UNCLEAR BLUE | UNKNOWN | YES | TEXTILE FIBRES |
| 4 | FILAMENT | (1.5,3) | DARK BLUE | UNKNOWN | YES | TEXTILE FIBRES |
| 5 | FILAMENT | (3.5,6) | BLUE | THREAD | YES | TEXTILE FIBRES |

A1

| CODE | GEOMETRY | COORDINATES | COLOUR | SURFACE APPEARANCE | OUR ASSESSMENT |
|------|----------|-------------|-----------------|--------------------|--------------------------|
| 1 | FILAMENT | (7,-2) | UNCLEAR | ROUGH DIRTY | TEXTILE FIBRE |
| 2 | DOT | (1,7) | YELLOW | FLAT | CELLULOSE |
| 3 | FILAMENT | (2,3) | UNCLEAR BLUE | UNKNOWN | TEXTILE FIBRE |
| 4 | FILAMENT | (1.5,3) | DARK BLUE | UNKNOWN | TEXTILE FIBRE |
| 5 | FILAMENT | (3.5,6) | BLUE | THREAD | ANIMAL HAIR |

A2

| CODE | GEOMETRY | COORDINATES | COLOUR | SURFACE APPEARANCE | OUR ASSESSMENT |
|------|---------------|-------------|--------------|--------------------|-----------------------|
| 1 | Filament | (2.5,-3) | blue | thread | Textile fibres |
| 2 | Bits of leaf | (4,6) | Brown yellow | shiny | Animal wings |
| 3 | Rubber band | (5,6) | blue | unknown | Textile fibres |
| 4 | filament | (7,-1.5) | Dark blue | unknown | Textile fibres |
| 5 | Flat particle | (-7,4) | yellow | unknown | animal |



| Sample | °C | washed | quantity/L |
|--------|-----|--------|------------|
| A1 | 10 | NO | 12 |
| A2 | 100 | NO | 12 |

**The effect of
cleaning outlet holes on
microplastic**

Sample number
naming method:

floor(1F/2F/3F)+
cold/hot water(C/H)+
cleaned/not cleaned
the water outlet(1/2)

eg: 1st floor,cold
water,didn't clean
the water outlet
=1FC2

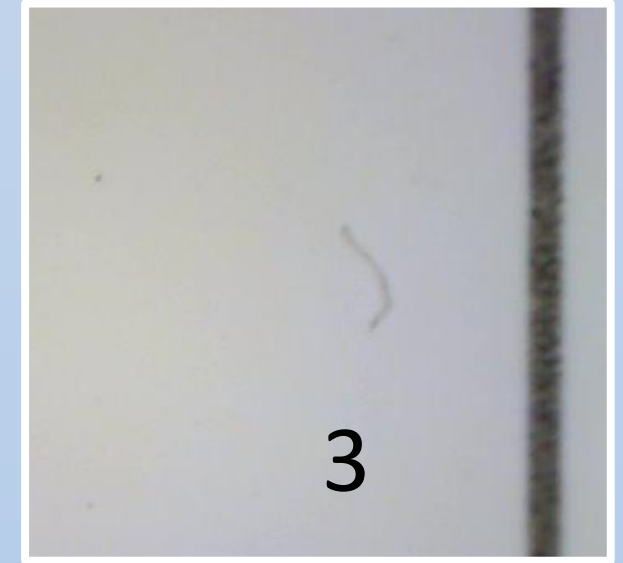
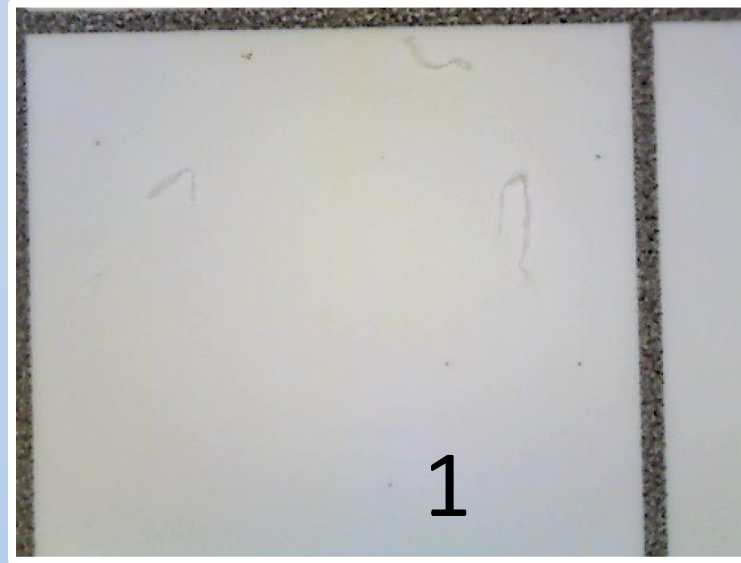
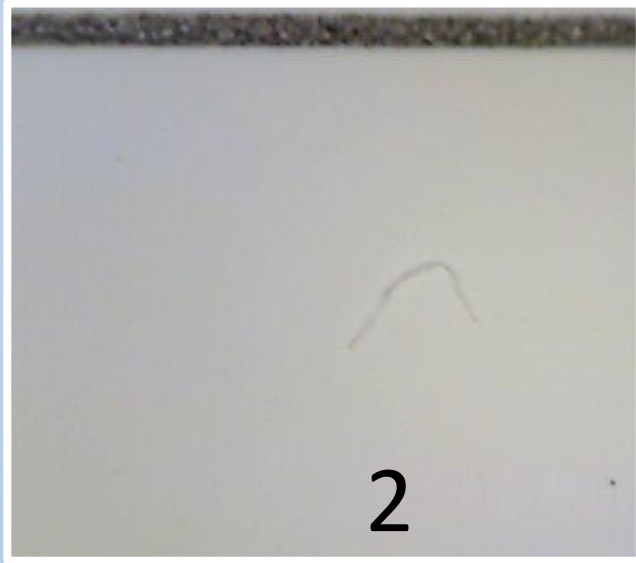


| | | | | | |
|--------------------------|------------------|------------------|-----------------|------------------|------------------|
| Code | 1FC2 | 1FH2 | 2FC2 | 3FC2 | 3FH2 |
| Washed | NO | NO | NO | NO | NO |
| Water Temperature | 10°C | 100°C | 10°C | 10°C | 100°C |
| Date | 2022/1/10 | 2022/1/10 | 2022/1/5 | 2022/1/10 | 2022/1/10 |
| Filter Membrane | 1 | 1 | 1 | 1 | 1 |

| | | | | | |
|--------------------------|------------------|------------------|-----------------|------------------|------------------|
| Code | 1FC1 | 1FH1 | 2FC1 | 3FC1 | 3FH1 |
| Washed | YES | YES | YES | YES | YES |
| Water Temperature | 10°C | 100°C | 10°C | 10°C | 100°C |
| Date | 2022/1/10 | 2022/1/10 | 2022/1/5 | 2022/1/10 | 2022/1/10 |
| Fliter Membrane | 1 | 1 | 1 | 1 | 1 |

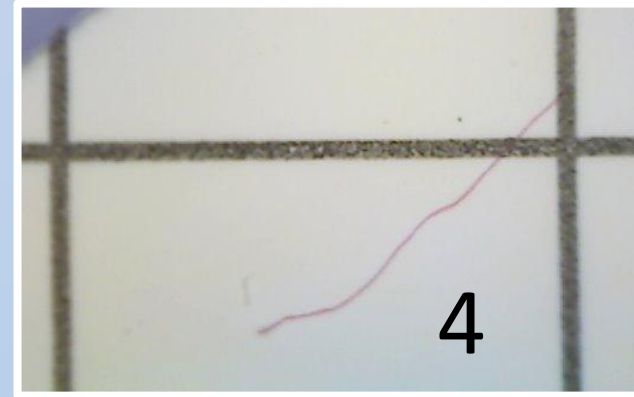
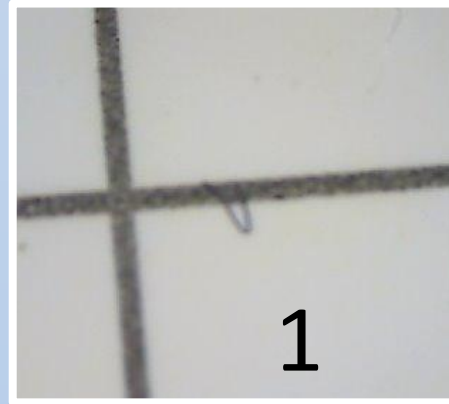
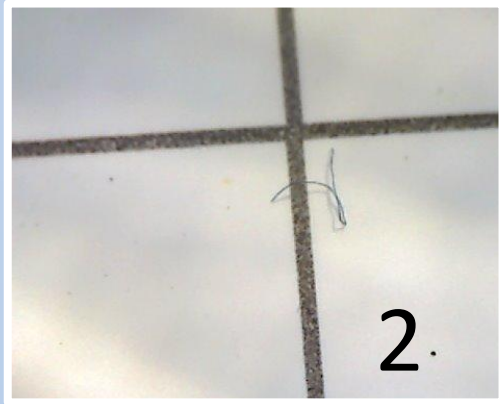
| CODE | sample | GEOMETRY | COORDINATES | COLOUR | SURFACE APPEARANCE | OUR ASSESSMENT |
|------|--------|----------|-------------|--------|--------------------|-----------------|
| 2FC2 | 1 | filament | (2,7) | gray | dirty | animal hair |
| | 2 | unknown | (6,-3) | black | unknown | unknown |
| | 3 | filament | (4,0.3) | gray | unknown | unknown |
| 2FC1 | 4 | filament | (6,3) | blue | unknown | textiles fibres |
| | 5 | filament | (-6,1) | gray | unknown | unknown |

3FC1



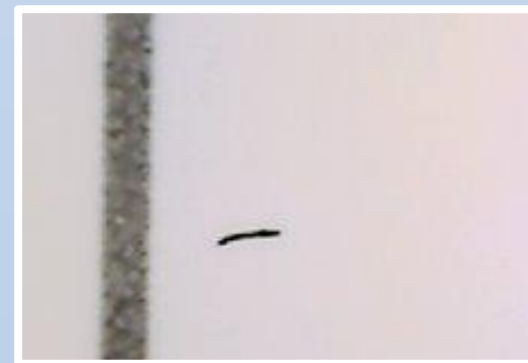
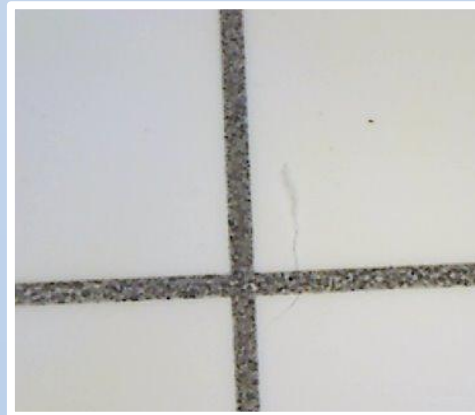
| CODE | GEOMETRY | COORDINATES | COLOUR | SURFACE APPEARANCE | OUR ASSESSMENT |
|------|----------|-------------|--------|--------------------|----------------|
| 1 | FILAMENT | (-7,3) | GRAY | UNKNOWN | Animal fibres |
| 2 | FILAMENT | (-5.5,5.3) | GRAY | UNKNOWN | |
| 3 | FILAMENT | (-3.8,6.5) | BLACK | UNKNOWN | |

3FC2



| CODE | GEOMETRY | COORDINATE S | COLOUR | SURFACE APPEARANCE | OUR ASSESSMENT |
|------|----------|--------------|-----------|--------------------|----------------|
| 1 | FILAMENT | (2,-6) | DARK BLUE | THREAD | TEXTILE FIBRES |
| 2 | FILAMENT | (3,-5) | DARK BLUE | THREAD | TEXTILE FIBRES |
| 3 | FILAMENT | (-7,-8) | RED | THREAD | TEXTILE FIBRES |
| 4 | FILAMENT | (2.5,3.5) | RED | THREAD | TEXTILE FIBRES |

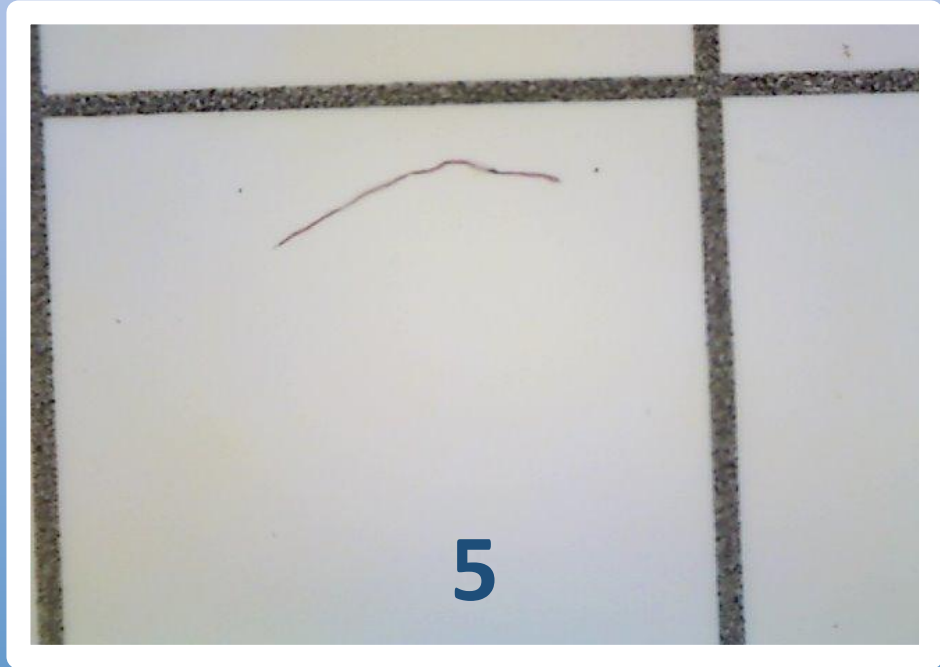
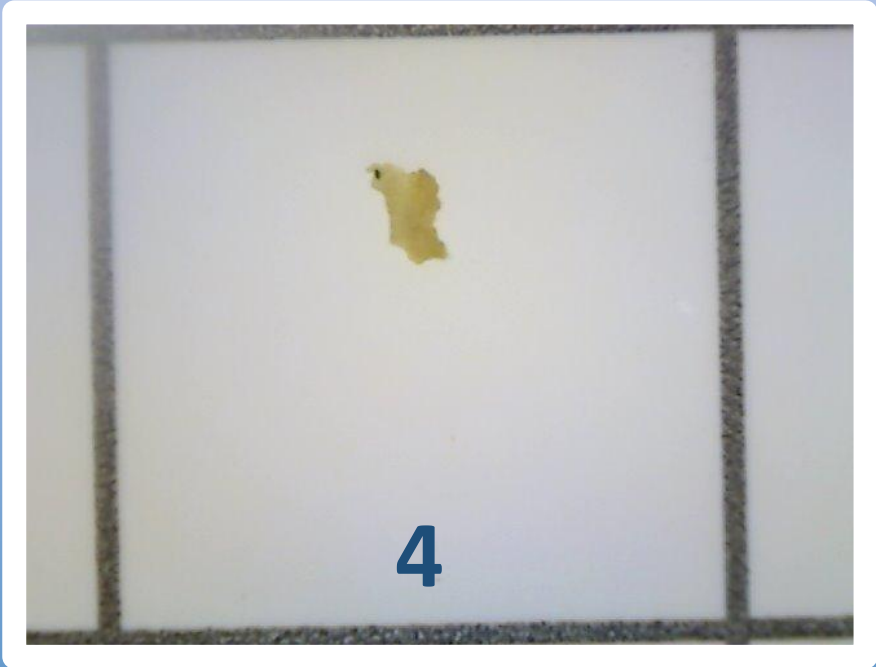
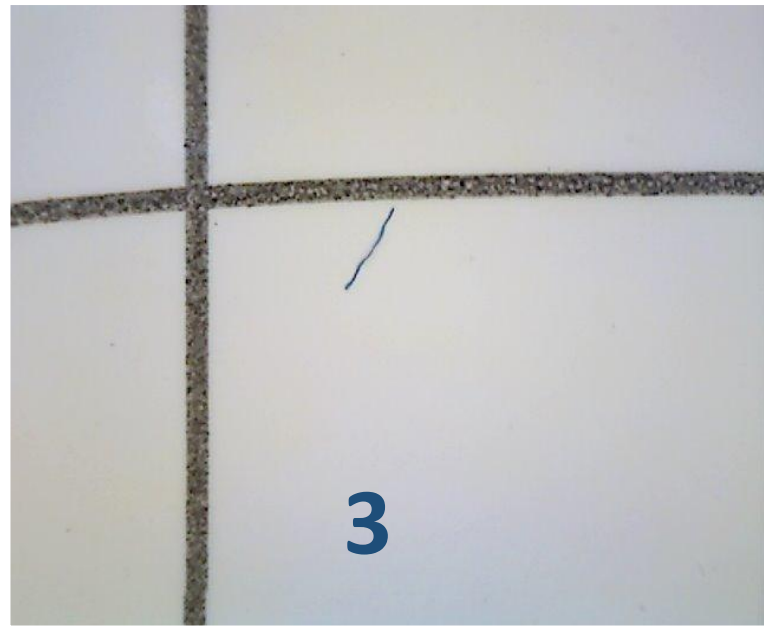
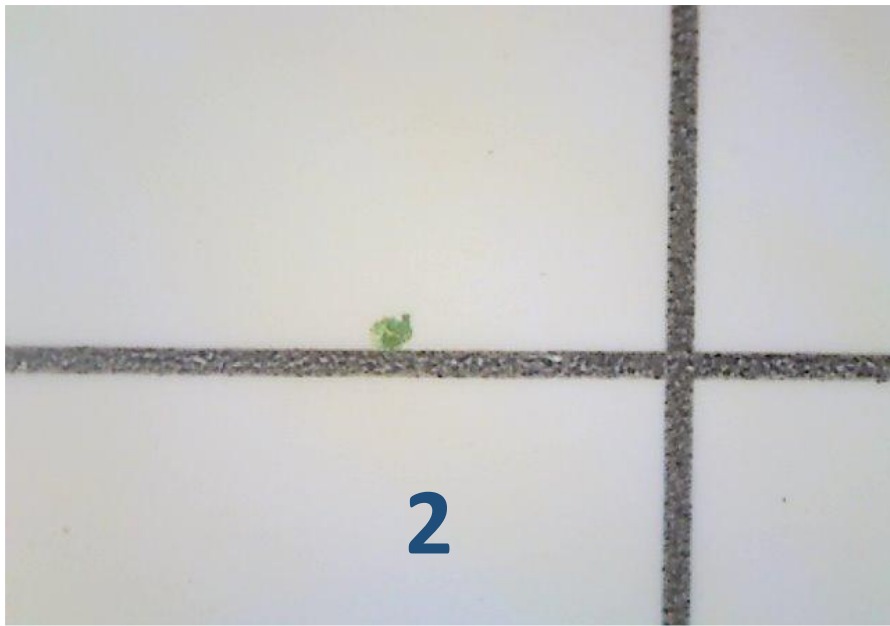
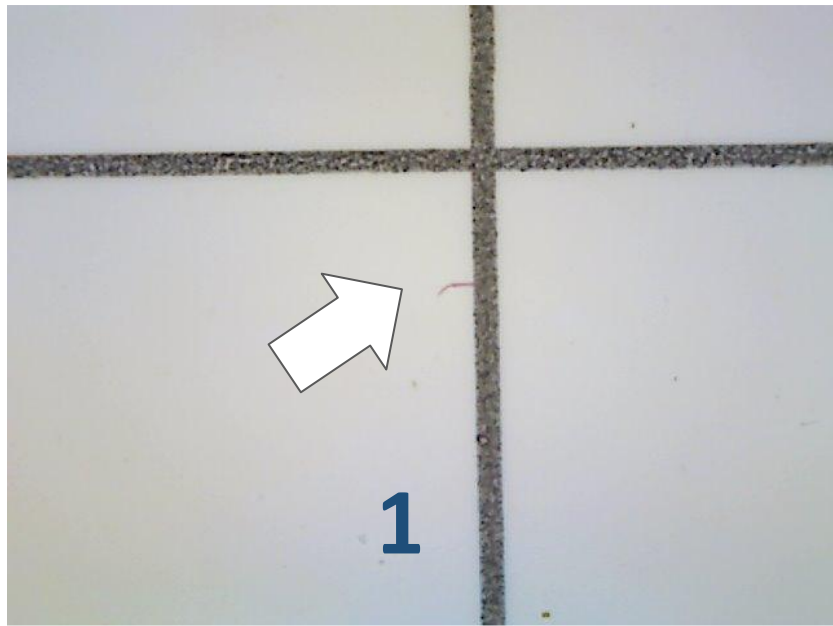
3FH1



| CODE | GEOMETRY | COORDINATES | COLOUR | SURFACE APPEARANCE | OUR ASSESSMENT |
|------|----------|-------------|--------|--------------------|---------------------|
| 1 | filament | (7.5,6.5) | gray | unknown | Biological Filament |
| 2 | filament | (5,-7) | gray | unknown | Textile Fibres |
| 3 | filament | (-6.2,5.5) | black | unknown | Textile Fibres |
| 4 | filament | (-3.5,6) | gray | unknown | Textile Fibres |

3FH2

| CODE | GEOMETRY | COORDINATES | COLOUR | SURFACE APPEARANCE | OUR ASSESSMENT |
|------|----------|-------------|--------|--------------------|----------------|
| 1 | FILAMENT | (4,2.2) | RED | UNKNOWN | TEXTILE FIBRE |
| 2 | DOT | (4.3,6) | GREEN | UNKNOWN | UNKNOWN |
| 3 | FILAMENT | (-2.25,7) | BLUE | UNKNOWN | TEXTILE FIBRE |
| 4 | DOT | (4,4) | YELLOW | UNKNOWN | UNKNOWN |
| 5 | FILAMENT | (3.5,6) | RED | UNKNOWN | TEXTILE FIBRE |



| Sample | °C | washed | quantity/L |
|--------|-----|--------|---|
| 2FC2 | 10 | No | 12 |
| 2FC1 | 10 | Yes | 8  |
| 2FH2 | 100 | No | 8 |
| 2FH1 | 100 | Yes | 0 |

| Sample | °C | washed | quantity/L |
|-------------|-----|--------|--|
| 3FC2 | 10 | No | 16 |
| 3FC1 | 10 | Yes | 12  |
| 3FH2 | 100 | No | 12 |
| 3FH1 | 100 | Yes | 12 |

| Sample | °C | washed | quantity/L |
|--------|-----|--------|--|
| 1FC2 | 10 | No | 32 |
| 1FC1 | 10 | Yes | 32 |
| 1FH2 | 100 | No | 36 |
| 1FH1 | 100 | Yes | 24  |

**Comparing the microplastic
content of water dispensers
on different floors**

| Sample | °C | washed | quantity/L |
|--------|----|--------|------------|
| 1F | 10 | Yes | 18 |
| 2F | 10 | Yes | 8 |
| 3F | 10 | Yes | 6 |

| Sample | °C | washed | quantity/L |
|--------|----|--------|------------|
| 1F | 10 | No | 20 |
| 2F | 10 | No | 12 |
| 3F | 10 | No | 18 |

| Sample | °C | washed | quantity/L |
|--------|-----|--------|------------|
| 1F | 100 | Yes | 24 |
| 2F | 100 | Yes | 0 |
| 3F | 100 | Yes | 18 |

| Sample | °C | washed | quantity/L |
|--------|-----|--------|------------|
| 1F | 100 | No | 18 |
| 2F | 100 | No | 8 |
| 3F | 100 | No | 6 |

Discuss

1. Each control experiment was completed on the same day, humidity, air pressure, air quality... are the control variables.
2. In addition to whether to clean the water outlet of the water dispenser, there are many factors that affect the content of microplastics in drinking water that we have not found so far.
3. The higher the air turbidity, the higher the microplastics. However, from the previous arguments, it can be inferred that the content of microplastics in drinking water is not much related to the water outlet holes of the water dispenser, so this does not seem to affect the microplastics content of drinking water.
4. Identifying other factors that affect the level of microplastics in drinking water and finding ways to reduce the level of microplastics in drinking water are our future prospects.

Conclusion:

- ★ The average microplastic content in drinking water (including cold water, hot water, with/without wash outlet) is 13.0
- ★ The temperature of the water does not affect the microplastic content in the water
- ★ Cleaning the water outlet of the water dispenser has no obvious effect on reducing the microplastic content of drinking water
- ★ The lower the floor, the higher the microplastic content in the air, but the influence of the microplastic content in drinking water is less
- ★ Women ingested an average of 35.1 microplastics per day; men ingested an average of 48.1 microplastics per day

THANK YOU FOR LOOKING



新北市立新店高中
New Taipei Municipal Hsin Tien Senior High School